

WHAT IS CLAIMED IS:

- Sub C1
- 5 1. A system for polishing one or more layers of a multi-layer substrate that includes a first metal layer and a second layer comprising (i) a liquid carrier, (ii) at least one oxidizing agent, (iii) at least one polishing additive that increases the rate at which the system polishes at least one layer of the substrate, wherein the polishing additive is selected from the group consisting of pyrophosphates, condensed phosphates, phosphonic acids and salts thereof, amines, amino alcohols, amides, imines, imino acids, nitriles, nitros, thiols, thioesters, thioethers, carbothiolic acids, 10 carbothionic acids, thiocarboxylic acids, thiosalicylic acids, and mixtures thereof, and (iv) a polishing pad and/or an abrasive.
- 15 2. The system of claim 1, wherein the liquid carrier is a nonaqueous solvent.
3. The system of claim 1, wherein the liquid carrier is water.
- 20 4. The system of claim 3, wherein the system comprises an abrasive suspended in the liquid carrier.
5. The system of claim 3, wherein the abrasive is fixed on the polishing pad.
- 25 6. The system of claim 3, wherein no abrasive is present in the system, and the polishing pad is a non-abrasive pad.
- 30 7. The system of claim 3, wherein at least one polishing additive is selected from the group consisting of di-phosphonic acids, tri-phosphonic acids, poly-phosphonic acids, phosphonoacetic acids, and mixtures thereof.
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- 35 8. The system of claim 7, wherein at least one oxidizing agent is a peroxide, and wherein the system further comprises at least one passivation film forming agent comprising one or more 5-6 member heterocyclic nitrogen-containing rings.

9. The system of claim 7, wherein at least one polishing additive is selected from the group consisting of ethylene di-phosphonic acid, 1-hydroxyethylidene-1,1-di-phosphonic acid, and a mixture thereof.

10. The system of claim 3, wherein at least one polishing additive is selected from the group consisting of primary amines, secondary amines, tertiary amines, hydroxylated amines, and mixtures thereof.

11. The system of claim 10, wherein at least one polishing additive comprises the structure $XY-NCR^1R^2CR^3R^4N-X'Y'$, wherein X, Y, X', Y', R¹, R², R³, and R⁴ are selected from the group consisting of hydrogen (H) atoms, heteroatom-containing functional groups, C₁-C₂₀ alkyl groups, heteroatom-containing C₁-C₂₀ alkyl groups, cyclic groups, heteroatom-containing cyclic groups, aromatic groups, heteroatom-containing aromatic groups, and combinations thereof.

12. The system of claim 11, wherein at least one polishing additive comprises the structure $XY-NCR_1R_2CR_3R_4N-X'Y'$, wherein X and X' are H atoms, and wherein Y, Y', R¹, R², R³, and R⁴ are selected from the group consisting of hydrogen (H) atoms, heteroatom-containing functional groups, alkyl groups, heteroatom-containing alkyl groups, cyclic groups, heteroatom-containing cyclic groups, aromatic groups, heteroatom-containing aromatic groups, and combinations thereof.

13. The system of claim 12, wherein at least one polishing additive comprises the structure $XY-NCR^1R^2CR^3R^4N-X'Y'$, wherein X, Y, X', and Y' are H atoms, and wherein R¹, R², R³, and R⁴ are selected from the group consisting of hydrogen (H) atoms, heteroatom-containing functional groups, alkyl groups, heteroatom-containing alkyl groups, cyclic groups, heteroatom-containing cyclic groups, aromatic groups, heteroatom-containing aromatic groups, and combinations thereof.

14. The system of claim 11, wherein at least one polishing additive is selected from the group consisting of aminoethylethanolamine, polyethyleneimine, and a mixture thereof.

15. The system of claim 12, wherein at least one polishing additive is ethylenediamine.

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16. The system of claim 13, wherein at least one oxidizing agent is a peroxide, and wherein the system further comprises at least one passivation film forming agent comprising one or more 5-6 member heterocyclic nitrogen-containing rings.

17. The system of claim 3, wherein at least one polishing additive is both (a) a compound selected from the group consisting of pyrophosphates, condensed phosphates, phosphonic acids and salts thereof, and (b) a compound selected from the group consisting of amines, amino alcohols, amides, imines, imino acids, nitriles, and nitros.

18. The system of claim 3, wherein at least one polishing additive is both (a) a compound selected from the group consisting of amines, amino alcohols, amides, imines, imino acids, nitriles, and nitros, and (b) a compound selected from the group consisting of thiols, thioesters, and thioethers, carbothiolic acids, carbothionic acids, thiocarboxylic acids, and thiosalicylic acids.

19. The system of claim 17, wherein at least one polishing additive is selected from the group consisting of 2-aminoethyl phosphonic acid, amino(trimethylenephosphonic acid), diethylenetriaminepenta(methylenephosphonic acid), hexamethylenediaminetetra(methylene phosphonic acid), and mixtures thereof.

20. The system of claim 3, wherein the system further comprises a source of ammonia.

21. The system of claim 20, wherein the system comprises (i) aminotri(methylenephosphonic acid) and (ii) ammonia or an ammonium salt.

22. The system of claim 3, wherein the system further comprises at least one stopping compound.

23. The system of claim 3, wherein the system further comprises at least one polymeric compound that reduces the polishing rate of at least one layer associated with the substrate.

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24. The system of claim 3, wherein the system further comprises at least one passivation film-forming agent.

25. The system of claim 3, wherein the abrasive is a metal oxide abrasive.

26. The system of claim 25, wherein the abrasive is selected from the group consisting of alumina, ceria, germania, silica, titania, zirconia, and coformed products thereof, and mixtures thereof.

27. The system of claim 26, wherein the abrasive is alumina.

28. A method of polishing a substrate comprising contacting a surface of a substrate with the system of claim 3 and polishing at least a portion of the substrate therewith.

29. A method of polishing a substrate comprising contacting a surface of a substrate with the system of claim 22 and polishing at least a portion of the substrate therewith.

30. A method for polishing one or more layers of a multi-layer substrate that includes a first metal layer and a second layer comprising the steps of:

- (a) contacting the first metal layer with the system of claim 3, and
- (b) polishing the first metal layer with the system until at least a portion of the first metal layer is removed from the substrate.

31. A method for polishing one or more layers of a multi-layer substrate that includes a first metal layer and a second layer comprising the steps of:

- (a) contacting the first metal layer with the system of claim 22, and
- (b) polishing the first metal layer with the system until at least a portion of the first metal layer is removed from the substrate.

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